Tips & Tricks for Bypass Graft PCI

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Types of Bypass Grafts

- LIMA/ RIMA
- Saphenous Vein Grafts
- Arterial grafts (radial, gastroepiploic)
Issues in SVG Interventions

1. Distal Embolization
2. No Reflow
3. Guide Catheter Support
4. Retrograde native segment PCI
5. Tortuosity
6. Aneurysmal disease
Prevention of Distal Embolization: Use of Embolic Protection

- Up to 90% occurrence reported
- ACC/AHA Guidelines on PCI 2015:
  - Class I indication to use EPD in SVGs
- However, use of EPD very low!
- Report from NCDR-CathPCI Registry → Used only in 23%!

A. Embolic Protection Filters

- Types of EPD:
  - Spider FX (3,4,5,6,7 mm diameter)
    - Workhorse wire can be used to cross lesions first
Embolic Protection Filters

- EZ-filter (Boston Scientific)
- Two sizes available
- Have to use the filter wire to cross lesion
- Wire can be difficult to manipulate through difficult lesions
Tips & Tricks

- Use 1mm larger than the size of SVG
- When retrieving, use “partial retrieval” technique
What if an EP Filter Wouldn’t Cross

- Remove it, flush it (can be re-used if the filter stayed inside the sheath)
- Pre-dilate with a 2.0mm balloon ➔ Try again
- Use a buddy wire to facilitate filter advancement
B. Pre-dilation versus direct stenting

- Direct stenting $\rightarrow$ Less distal embolization
- Registry of 527 unselected patients with SVG PCI

<table>
<thead>
<tr>
<th></th>
<th>DS (n=168)</th>
<th>Balloon+stent (n=355)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MACE</td>
<td>21.5%</td>
<td>34.3%</td>
<td>0.02</td>
</tr>
<tr>
<td>Death (%)</td>
<td>5.3</td>
<td>10.4</td>
<td>0.045</td>
</tr>
<tr>
<td>QWMI (%)</td>
<td>9.2</td>
<td>11.8</td>
<td>0.27</td>
</tr>
<tr>
<td>TLR</td>
<td>15.4</td>
<td>21.4</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Pre-dilation versus direct stenting

Figure. KM curves showing event-free survival for the combined end point of death, MI, and revascularization in the DS group and in the CS group

No Reflow

- Plugging of microvasculature can cause slow or no-reflow.
- Independent predictors:
  - probable thrombus (OR: 6.9; 95% CI: 2.1 to 23.9; \( p = 0.001 \))
  - acute coronary syndromes (OR: 6.4; 95% CI: 2.0 to 25.3; \( p = 0.003 \))
  - degenerated SVG (OR: 5.2; 95% CI: 1.7 to 16.6; \( p = 0.003 \))
  - lesion ulceration (OR: 3.4; 95% CI: 0.99 to 11.6; \( p = 0.04 \)) (16).

If filter full of debris & flow is poor → Aspiration thrombectomy before removing filter

### Pharmacologic Treatment

<table>
<thead>
<tr>
<th></th>
<th>Effectiveness</th>
<th>Doses</th>
<th>Adverse Effect</th>
<th>Caveat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nicardipine</td>
<td>98%</td>
<td>100-200mcg</td>
<td>N/A</td>
<td>Best data for prevention</td>
</tr>
<tr>
<td>Adenosine</td>
<td>92-94%</td>
<td>20-40 mcg</td>
<td>Flushing, brady</td>
<td>Asthma</td>
</tr>
<tr>
<td>Nitropruside</td>
<td>&gt;90%</td>
<td>50-200 μg</td>
<td>Hypotension (hypovolemic)</td>
<td>Don’t use in renal failure</td>
</tr>
<tr>
<td>Verapamil</td>
<td>&gt;90%</td>
<td>100-200mcg</td>
<td>Bradycardia</td>
<td>Bradycardic, CHF</td>
</tr>
<tr>
<td>Nitropruside +</td>
<td>&gt;90%</td>
<td>As above</td>
<td>Hypotension, Brady</td>
<td>Caution: Renal failure</td>
</tr>
<tr>
<td>Adenosine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Best method of delivery to microvasculature:**
Use a microcatheter (aspiration thrombectomy catheter)
Aorto-ostial Lesions in SVGs

- Like native CAD, calcification more common ➔ Cutting balloon, debulking
- Szabo technique
- Accept “less than perfect” result because aggressive post-dilation of ostial stents can cause anastomosis rupture
- Higher stroke risk
Degenerated SVGs

• Avoid if native artery can be revascularized
• Consider extra doses of vasodilators
• Minimize stenting length, as much as possible
Large Thrombus Burden

- Aspiration or rheolytic thrombectomy
- Use guide as an aspiration catheter
- Intra-graft 5-10mg thrombolytic bolus
Radial vs. Femoral Approach

• Left radial better to engage right-sided
• Right radial better to engage left-sided SVG
• If left-sided SVG still too far, consider Guideliner, Guidezilla extension then, wire
Guide Catheter Selection: SVGs

• Support is key
• Left-sided grafts:
  – LCB, AL 1-2
• Right-sided grafts:
  – Usually, downward take-off
  – MP, AR, JR4
  – If posteriorly located → AL guides
LIMA Interventions

- Off horizontal limb of subclavian → IMA guide
- Off ascending limb of subclavian → JR4 guide
- If difficult to engage → Use soft wire to “fall” into LIMA → use the wire as a rail to pull guide to its ostium
- LIMA prone to spasm and dissection!
- If pseudo-lesions develop and can’t inject contrast → replace wire with a transit catheter (i.e., finecross) → pseudo-lesions will disappear
LIMA Interventions

- Scout cine of left subclavian in RAO or AP projection before selective engagement
- If too tortuous → consider medical therapy
- If using radial → prefer left
- Right radial to LIMA → Simmons Catheter
- Always assess the subclavian artery itself for stenosis by pressure gradient
- Be extra careful if last patent graft

Never inject into LIMA if pressure tracing not perfect → Dissection!
RIMA Interventions

• LAO 50 to visualize ostium
• Take JR4 or IMA guide distal to ostium → Let wire “fall” into RIMA → Pull guide into ostium
Case: PCI of Retrograde Native vessel via SVG

- 53 year old male
- CABG 7 years ago
- Admitted with ACS
- Meds
  - Metoprolol 100mg BID
  - Amlodipine 10mg
- LM: Normal
- LAD: 100% ostial
- Circ: Normal
- RCA: 100% Prox
- LIMA-LAD: Patent
- SVG-RPL: Patent, but RPL 90%
Lesion Retrograde from SVG
Failed Angioplasty
When #6F Guideliner fails? What Next?

- Larger Guide
- Larger Guideliner support
- Two wires
- Support Catheter: Corsair
When You Need All the Tricks!

- #8F guideliner
- Corsair
- Two wires
Stent U-turn

Stent in Desired Position
Final Result
Take Home Points

• For SVG, always use embolic protection filter when possible (exception: anastomotic lesion with small native vessel)

• For SVGs → Use both pharmacologic and embolic protection pre-emptively

• Pre-dilatation should be avoided in SVG grafts (if possible) to prevent distal embolization

• Subclavian stenosis → LIMA-LAD ischemia (Assess subclavian artery stenosis for pressure gradient)
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